ABSTRACT OF THE DISCLOSURE

A method for identifying and modeling nonlinearities in communications channels, particularly optical communication channels. A channel in general is modeled as a summation of linear and non linear terms having memory. The terms are functions of the input to the channel with respect to time, such as a sequence of input bits to the channel. In one embodiment the most recent 5 input bits to the optical channel are used to access a value in a look up table. The value accessed is then compared to an actual value received from the channel. The difference between the value in the table and the actual channel value may be used to correct the value in the table, for example using a LMS (Least Means Squared) algorithm. When the look up table and the channel converge the look up table contains a model of the channel with memory that can model nonlinearities. A nonlinear channel having memory may also be modeled in terms of Volterra Kernels, which may equivalently change into a look up table model using the Hadamard transform. The Volterra Kernel representation also has the added advantage that it can represent a look up table of N table entries in at most N-1 Volterra kernels. In many cases only a few Volterra Kernels are required to model the behavior of the channel. For example embodiments are disclosed in which two Kernels may model a nonlinear fiber optic channel, operating at a wavelength of 850 nanometer through a multimode channel at a data rate of 1 Gigabit per second.